CLAIMS

1. A force sensing touch location device for sensing a touch force applied to a touch surface, the touch force including a perpendicular component that is perpendicular to a surface of accuracy of the touch device and a tangential component that is tangential to said surface of accuracy, the force sensing touch location device comprising:

a plurality of force sensors that develop signals in response to application of the touch force to the touch surface; and

a first mechanical path to transmit the majority of the tangential component of the touch force, wherein the first path does not include the plurality of force sensors.

2. The force sensing touch location device of claim 1, further comprising:

a second mechanical path to transmit the majority of the perpendicular component of the touch force through the plurality of force sensors.

3. The force sensing touch location device of claim 1, wherein the first mechanical path comprises a plurality of shunt connections coupled to the touch surface.

4. The force sensing touch location device of claim 3, wherein the plurality of shunt connections comprise lateral stiffening means for impeding lateral motion of the touch surface.

5. The force sensing touch location device of claim 4, wherein the lateral stiffening means has a plane of substantially zero reaction moment to the tangential component of the touch force, and wherein the plane of substantially zero reaction moment is substantially coincident with the touch surface.

6. The force sensing touch location device of claim 2, wherein the at least one force sensor includes a perpendicular force path that is substantially stiff and wherein the lateral stiffening means includes a perpendicular force path that is substantially soft.

7. The force sensing touch location device of claim 4, wherein the lateral stiffening means comprises a thin member that joins the touch surface to a surrounding frame.

8. The force sensing touch location device of claim 7, wherein the thin member comprises a strip of tape.

9. The force sensing touch location device of claim 7, wherein the thin member bridges a small gap between the touch surface and an edge of the frame.

10. The force sensing touch location device of claim 7, wherein a freely flexing region of the thin member extends a distance beyond an edge of the touch surface.

11. The force sensing touch location device of claim 7, wherein the thin member is constructed of high-modulus material to be substantially stiff to tangential movement of the touch surface and substantially compliant to perpendicular motion of the touch surface.

12. The force sensing touch location device of claim 7, wherein the thin member includes a compliant contour between the touch surface and the frame.

13. The force sensing touch location device of claim 12, wherein the compliant contour is compliant in a direction normal to the touch surface and stiff in a direction parallel to the touch surface.

14. The force sensing touch location device of claim 7, wherein the lateral stiffening means impedes the passage of foreign substances between the touch surface and the frame.

15. The force sensing touch location device of claim 14, wherein the thin member joins the entire circumference of the touch surface to the frame.

16. The force sensing touch location device of claim 4, wherein the touch surface comprises a display surface.

17. The force sensing touch location device of claim 16, wherein the touch surface comprises an LCD.

18. The force sensing touch location device of claim 4, wherein the touch surface comprises a touch overlay overlaying a display surface.

19. The force sensing touch location device of claim 1, wherein force paths passing through the force sensors pass also through lateral softening means for reducing the proportion of the tangentially applied touch force transmitted through the force sensors.

20. The force sensing touch location device of claim 1, wherein the second path comprises lateral softening means for directing the majority of the tangential component of the touch force through the first path.

21. The force sensing touch location device of claim 20, wherein the lateral softening means is disposed between the touch surface and at least one of the plurality of force sensors.

22. The force sensing touch location device of claim 20, wherein the lateral softening means comprises a columnar structure.

23. The force sensing touch location device of claim 22, wherein the columnar structure comprises a portion of a diffuser including a boss contacting the at least one force sensor.

24. The force sensing touch location device of claim 21, wherein the lateral softening means comprises an elastomer.

25. The force sensing touch location device of claim 24, wherein the lateral softening means comprises a disk of tape backed by a soft adhesive.

26. The force sensing touch location device of claim 1, wherein the force sensing touch location device is a handheld device.

27. The force sensing touch location device of claim 1, wherein the elastic center of the surface of accuracy is within a predetermined distance of the touch surface.

28. A force sensing touch location device for sensing a touch force applied to a touch surface, the force sensing touch location device comprising:

a plurality of force sensors that develop signals in response to application of the touch force to the touch surface; and

a first mechanical path to transmit the majority of the touch force, wherein the first path does not include the plurality of force sensors.

29. The force sensing touch location device of claim 28, wherein the first mechanical path comprises a plurality of shunt connections coupled to the touch surface.

30. The force sensing touch location device of claim 29, wherein the plurality of shunt connections comprise lateral stiffening means for impeding lateral motion of the touch surface.

31. The force sensing touch location device of claim 30, wherein the lateral stiffening means has a plane of substantially zero reaction moment to the tangential component of the touch force, and wherein the plane of substantially zero reaction moment is substantially coincident with the touch surface.

32. The force sensing touch location device of claim 30, wherein the touch surface comprises a display surface.

33. The force sensing touch location device of claim 32, wherein the touch surface comprises an LCD.

34. The force sensing touch location device of claim 30, wherein the touch surface comprises a touch overlay overlaying a display surface.

35. A force sensing touch location device for sensing a touch force applied to a touch surface, the touch force including a perpendicular component that is perpendicular to a surface of accuracy of the touch device and a tangential component that is tangential to said surface of accuracy, the force sensing touch location device comprising:

a plurality of force sensors that develop signals in response to application of the touch force to the touch surface; and

a first force path passing through at least one of the plurality of force sensors, wherein the fraction of the perpendicular component that is transmitted through the first force path is substantially greater than the fraction of the tangential force component that is transmitted through the first force path.

36. The force sensing touch location device of claim 35, wherein the ratio of the fraction of the perpendicular component that is transmitted through the first force path to the fraction of the tangential component that is transmitted through the first force path is at least 3:2.

37. A force sensing touch location device for sensing a touch force applied to a touch surface, the touch force including a perpendicular component that is perpendicular to a surface of accuracy of the touch device and a tangential component that is tangential to said surface of accuracy, the force sensing touch location device comprising:

a plurality of sensors that develop signals in response to application of the touch force to the touch surface;

at least one sensing connection coupled between the plurality of sensors and the touch surface, the at least one sensing connection developing a corresponding reaction force to the tangential component of the touch force, the at least one sensing connection having an axis of sensitivity that is substantially perpendicular to the corresponding reaction force and oblique with respect to a normal to the touch surface.

38. The force sensing touch location device of claim 37, wherein the plurality of sensors comprise a plurality of force sensors.

39. The force sensing touch location device of claim 37, wherein the plurality of sensors comprise a plurality of displacement sensors.

40. The force sensing touch location device of claim 37, further comprising:

a plurality of elastic means, coupled between the touch surface and at least one connecting surface, for positioning the elastic center of the at least one sensing connection substantially within the surface of accuracy.

41. The force sensing touch location device of claim 40, wherein each of the plurality of elastic means is coupled between the touch surface and a surface of one of the plurality of sensors.

42. The force sensing touch location device of claim 40, wherein the force sensing touch location device further comprises a rigid support surface in contact with the plurality of sensors, wherein the at least one sensing connection comprises a plurality of sensing connections, wherein the connecting surface comprises the rigid support surface, and wherein the elastic center of each of the plurality of sensing connections is located substantially within the surface of accuracy.

43. The force sensing touch location device of claim 40, wherein the force sensing touch location device further comprises a rigid support surface in contact with the plurality of sensors, wherein the connecting surface comprises the rigid support surface, and wherein an overall elastic center of the plurality of sensing connections is located substantially within the plane of accuracy.

44. The force sensing touch location device of claim 40, wherein the elastic means comprises a first elastic portion and a second elastic portion meeting at an inflection point substantially within the surface of accuracy, whereby the elastic center of the at least one sensor connection is positioned substantially within the surface of accuracy.

45. The force sensing touch location device of claim 40, wherein the at least one sensing connection comprises a plurality of sensing connections, and wherein the plurality of elastic means comprise elements that have principal axes of stiffness that are oblique with respect to the surface of accuracy, thereby positioning the elastic center of each of the plurality of sensing connections substantially within the surface of accuracy.

46. The force sensing touch location device of claim 40, wherein the at least one sensing connection comprises one sensing connection, and wherein the plurality of elastic means have principal axes of stiffness that are oblique with respect to the surface of accuracy, thereby positioning the elastic center of the one sensing connection substantially within the surface of accuracy.

47. A force sensing touch location device for sensing a touch force applied to a touch surface, the touch force including a perpendicular component that is perpendicular to a surface of accuracy of the touch device and a tangential component that is tangential to said surface of accuracy, the force sensing touch location device comprising:

a plurality of sensors that develop signals in response to application of the touch force to the touch surface;

at least one sensing connection coupled between the plurality of sensors and the touch surface, the at least one sensing connection developing a corresponding reaction force to the tangential component of the touch force, the at least one sensing connection having an axis of sensitivity that is substantially perpendicular to the corresponding reaction force.

a plurality of elastic means, coupled between the touch surface and at least one connecting surface, the plurality of elastic means including components that are oblique with respect to the surface of accuracy, whereby the elastic center of the at least one sensing connection is positioned substantially within the surface of accuracy.

48. The force sensing touch location device of claim 47, wherein the plurality of sensors comprise a plurality of force sensors.

49. The force sensing touch location device of claim 47, wherein the plurality of sensors comprise a plurality of displacement sensors.

50. The force sensing touch location device of claim 47, wherein the axis of sensitivity of the at least one sensing connection is oblique with respect to a normal to the touch surface.

51. The force sensing touch location device of claim 50, wherein each of the plurality of elastic means is coupled between the touch surface and a surface of one of the plurality of sensors.

52. The force sensing touch location device of claim 50, wherein the force sensing touch location device further comprises a rigid support surface in contact with the plurality of sensors, wherein the at least one sensing connection comprises a plurality of sensing connections, wherein the connecting surface comprises the rigid support surface, and wherein the elastic center of each of the plurality of sensing connections is located substantially within the surface of accuracy.

53. The force sensing touch location device of claim 50, wherein the force sensing touch location device further comprises a rigid support surface in contact with the plurality of sensors, wherein the connecting surface comprises the rigid support surface, and wherein an overall elastic center of the plurality of sensing connections is located substantially within the plane of accuracy.

54. The force sensing touch location device of claim 50, wherein the elastic means comprises a first elastic portion and a second elastic portion meeting at an inflection point substantially within the surface of accuracy, whereby the elastic center of the at least one sensor connection is positioned substantially within the surface of accuracy.

55. The force sensing touch location device of claim 50, wherein the at least one sensing connection comprises a plurality of sensing connections, and wherein the plurality of elastic means comprise elements that have principal axes of stiffness that are oblique with respect to the surface of accuracy, thereby positioning the elastic center of each of the plurality of sensing connections substantially within the surface of accuracy.

56. The force sensing touch location device of claim 50, wherein the at least one sensing connection comprises one sensing connection, and wherein the plurality of elastic means have principal axes of stiffness that are oblique with respect to the surface of accuracy, thereby positioning the elastic center of the one sensing connection substantially within the surface of accuracy.